

## Patent claims

1. A powder mixture for resorbable calcium phosphate biocements, characterized by a fraction mixture consisting of (relative to the total volume of the powder mixture):

40-99% by volume of powder having a particle size of  $0.1\text{-}10\mu\text{m}$

1-20% by volume of powder having a particle size of  $10\text{-}43\mu\text{m}$

0-59% by volume of powder having a particle size of  $43\text{-}315\mu\text{m}$

which powder is obtained by grinding the spontaneously crystallizing melts of a material comprising crystalline and X-ray amorphous phases, which material

a) according to  $^{31}\text{P}$ -NMR measurements, contains  $\text{Q}_0$ -groups of orthophosphate and  $\text{Q}_1$ -groups of diphosphate, the orthophosphates or  $\text{Q}_0$ -groups making up 65 to 99.9% by weight relative to the total phosphorus content of the powder mixture and the diphosphates or  $\text{Q}_1$ -groups making up 0.1 to 35% by weight relative to the total phosphorus content of the powder mixture, and

b) according to X-ray diffractometric measurements and relative to the total weight of the powder mixture, contains 35 to 99.9% by weight of a main crystal phase selected from the group consisting of  $\text{Ca}_2\text{K}_{1-x}\text{Na}_{1+x}(\text{PO}_4)_2$ , where  $x = 0.1$  to  $0.9$ ,  $\text{Ca}_{10}\text{Na}(\text{PO}_4)_7$ ,  $\text{Ca}_{10}\text{K}(\text{PO}_4)_7$ , mixtures thereof and mixed crystals according to the general formula  $\text{Ca}_{10}\text{K}_x\text{Na}_{1-x}(\text{PO}_4)_7$ , where  $x = 0$  to  $1$ , and 0.1 to 20% by weight of a substance selected from the group consisting of  $\text{Na}_2\text{CaP}_2\text{O}_7$ ,  $\text{K}_2\text{CaP}_2\text{O}_7$ ,  $\text{Ca}_2\text{P}_2\text{O}_7$ ,  $\text{NaPO}_3$ ,  $\text{KPO}_3$  and mixtures thereof as a secondary crystal phase, and

c) besides the main crystal phase, contains an X-ray amorphous phase which in total makes up 0.1 to 65% by weight relative to the total weight of the powder mixture.

2. A powder mixture according to Claim 1, wherein said mixture contains 0.1-15% by weight, preferably 0.5-4% by weight chain phosphates selected from among  $\text{NaPO}_3$ ,  $\text{KPO}_3$ , mixed crystals thereof and mixtures of the foregoing, which are indicated by  $\text{Q}_2$ -groups in  $^{31}\text{P}$ -NMR measurements.

3. A powder mixture according to Claim 1, wherein the orthophosphates make up 40 to 95% by weight.

4. A powder mixture according to Claim 3, wherein the orthophosphates make up 50 to 90% by weight.

5. A powder mixture according to Claim 1, wherein the diphosphates make up 1 to 22% by weight, preferably 5 to 22% by weight.

6. A powder mixture according to Claim 5, wherein the diphosphates make up 5 to 22% by weight.

7. A powder mixture according to Claim 1, wherein in the melted or ground state said mixture consists of (in % by weight):

30	to	55	P <sub>2</sub> O <sub>5</sub>
25	to	50	CaO
1	to	20	Na <sub>2</sub> O
0.5	to	20	K <sub>2</sub> O
0.1	to	13	MgO
0.0	to	10	SiO <sub>2</sub>

MgO or SiO<sub>2</sub> or a mixture thereof making up at least 1% by weight, and the corresponding crystal phases.

8. A powder mixture according to Claim 1, wherein said mixture contains up to 10% of a silicate phase.

9. A powder mixture according to any of Claims 1 through 3, wherein said mixture additionally contains up to 30% by weight alpha-tricalcium phosphate, beta-tricalcium phosphate or mixtures thereof besides the powder obtained by a melting process.

10. A powder mixture according to Claims 1 through 9, wherein said mixture additionally contains an active agent selected from the group consisting of antibiotics, other pharmaceutical active agents, disinfectants, bacteriostats and mixtures thereof.

11. A powder mixture according to Claims 1 through 9, wherein said mixture is provided in the form of an aqueous solution, a suspension or a paste.
12. A powder mixture according to Claim 1, wherein in mixed crystals the element Ca is replaced by Mg in an amount ranging up to 20% by weight relative to the weight of the powder mixture.
13. A powder mixture according to Claims 1 through 12, wherein said mixture is provided in a two-component kit wherein one component is said powder and the other component is made up of a water phase.
14. The use of the powder mixture according to any of Claims 1 through 13 for manufacturing resorbable calcium phosphate biocements which contain less than 20% by weight hydroxyapatite (HA) and/or precipitated hydroxyapatite besides their initial main crystal phases once the setting process of the cement is finished.
15. The use according to Claim 14 by mixing a powder mixture according to Claim 1 with pure water or aqueous solutions.
16. The use according to Claim 15, characterized in that the setting process takes place using aqueous solutions additionally containing cations, particularly sodium and potassium, and anions, particularly chlorides.
17. The use according to Claim 16, characterized in that cohesion promoters and/or setting accelerators are added to the aqueous solution.
18. The use according to Claim 17, characterized in that compounds from the groups of hydroxyethyl starch, soluble starch, cyclodextrins, alginates, dextran sulphates, polyvinylpyrrolidone and/or hyaluronic acid are selected as cohesion promoters and disodium hydrogen phosphate is added to the aqueous solution as a setting accelerator.

19. The use according to Claim 16, characterized in that the aqueous solution is mixed with the cement powder at a ratio ranging between 0.15 and 0.4ml/g, preferably 0.18 and 0.23ml/g.

20. The use according to Claim 14 of a mixture provided in the form of an aqueous solution, a suspension or a paste for manufacturing a biodegradable bone replacement material which can be used both for filling defects in vivo and for cultivating cells in vitro in tissue engineering.

21. A biodegradable implant having an open-pore or closed-pore structure, which implant is manufactured using a mixture according to Claim 1 which is provided in the form of an aqueous solution, a suspension or a paste and has set ex vivo.